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III. A New Species of the Endemic Genus *Straneoa* Basilewsky, 1953, from São Tomé (Insecta: Coleoptera: Carabidae: Platynini)

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A new species of the platynine genus *Straneoa* Basilewsky, *S. seligmani* Kavanaugh sp. nov., is described from the Gulf of Guinea, Republic of São Tomé and Príncipe, Ilha São Tomé (type locality: forest between Lagoa Amelia and Bom Sucesso, 1200–1500m, Parque Nacional Ôbó). Both this and the only previously known species, *S. collatata* (Karsch), apparently are endemic to Ilha São Tomé and microsympatric in geographical and habitat distributions. Adults of the two species differ in size, pronotal and elytral shape, pronotal, elytral, and tarsal chaetotaxy, and in characters of both male and female genitalia.

In 2001, the California Academy of Sciences conducted a two-month long multidisciplinary research expedition to the two geologically oldest islands in the Gulf of Guinea, Príncipe and São Tomé. Drewes (2002) provided a popular account of the scope and goals of the expedition, and Drewes and Wilkinson (2004) presented a more detailed introduction to the geologic history of these two islands, which are notable for their highly endemic but poorly known flora and fauna. Field efforts by the Academy's two participating arachnologists, Charles E. Griswold and Joel M. Ledford, and one of its herpetologists, Jens Vindum, resulted in the collection of nearly 1,500 insect specimens, including 642 beetles of the family Carabidae, the group of my particular research interest.

Among the carabid specimens, all collected on the island of São Tomé, most were members of the platynine genus *Straneoa* Basilewsky, 1953, which is apparently endemic to that island and previously known from a single species, *Straneoa collatata* (Karsch). Scattered among four of the 11 pitfall trap and hand-collected samples from three different sites that included specimens of *S. collatata* were 16 specimens that are smaller in size and distinctly different in external form, but no doubt closely related to *S. collatata*. Subsequent dissections and study of both male and female genitalic structures revealed several clear and consistent differences between these smaller specimens and *S. collatata* adults. I conclude that the former represent a second, distinct species of *Straneoa* and provide here a description of this new species and compare adult features with those of *S. collatata*.

Materials and Methods

This study is based on the examination of 577 adult specimens of *Straneoa* species, all from the 2001 expedition. Measurements were made with the aid of an ocular micrometer in a Wild M5 stereoscopic dissecting microscope. I provide two measures of body size: apparent body length (APL) = the distance measured along the midline from the apex of the labrum to a point opposite the apex of the longer elytron; and standardized body length (SBL) = the sum of three measurements: headlength, measured along the midline from the apical margin of the clypeus to a point opposite the posterior margin of the compound eyes; pronotal length, measured along the midline from the apical to the basal margin; and elytral length, measured along the midline from the apex of the scutellum to a point opposite the apex of the longer elytron. SBL is the preferred measurement because it is the sum of three fixed lengths only and so avoids variation in the alignment and/or retraction or extension of body parts.

Visualization and study of female genitalic structures was enhanced by staining dissections with Chlorozol Black E. Digital color images of specimens and selected structures and dissections were created using an Automontage imaging system from Synchroscopy.

Genus *Straneoa* Basilewsky

Straneoa Basilewsky, 1953:273. Type species: *Zargus collatatus* Karsch, 1881:56, by monotypy.

Karsch (1881) included his new species in genus *Zargus* Wollaston of the carabid tribe Licinini. Basilewsky (1953) recognized both the true affinity of *Z. collatatus* (namely, with the Anchomeninae [= Platynini] rather than with the Licinini) and the distinctiveness of this taxon among known platynines. He proposed a new genus, *Straneoa*, for this species and recognized the following features as diagnostic: body large, wide, and flat, with a large head and pronotum; head shiny and pronotum and elytra very dull, matte; head with the typical two pairs of supraorbital setae plus an additional two pairs of setae slightly behind and medial to the hind supraorbital setae; elytral intervals 3, 5, and 7 with setiferous pore punctures, mainly in the basal half, and the umbilicate series comprised of about 36 fixed setae. Most of these features are shared by adults of both *S. collatata* and the new species as described below.

The phylogenetic relationships of *Straneoa* among platynines remain unclear at present. Its closest relatives are likely to be found among the Afrotropical Platynini, which still require much further study and phylogenetic analysis.

Straneoa collatata (Karsch)

Figs. 1, 3, 5, 7, 9, 11.

Zargus collatatus Karsch, 1881:56. Holotype in Zoological Museum, Berlin. Type locality: Ilheo de Rolas (= Ilha São Tomé).

Platynus opacipennis Straneo, 1943:55. Holotype in Straneo Collection at Museo Civico di Storia Naturale di Genoa. Type locality: Agua Izè, Ilha São Tomé.

Straneo's (1943) description of *Platynus opacipennis* and Basilewsky's (1953) description of genus *Straneoa* together provide an excellent composite description of *S. collatata*. Because I've had many more specimens available to me than either of these scholars, I'm able to add the following information on variation in certain features beyond what they could provide.

Size range: ABL: males 14.1 to 18.1 mm, females 14.1 to 19.2 mm; SBL: males 13.2 to 16.5 mm, females 12.7 to 17.2 mm. Number of midlateral setae on pronotum—all specimens have a seta

at about the midpoint of the lateral margin and more than 50% of specimens of both sexes have a second midlateral seta, either bilaterally or unilaterally, slightly anterior to middle (Fig. 3). Number of setiferous pore punctures on elytral intervals 3, 5, and 7 — interval 3: 5 to 8 pores; interval 5: 3 to 5 pores ; and interval 7: 2 to 5 pores. Number of setiferous pore punctures in umblicate series — ranges between 30 and 40 setiferous pores.

A total of 561 specimens of *S. collatata* were collected by the expedition team and examined as part of this study. Collection data for these specimens are as follows: Bom Sucesso at Ecofac Jardin Botanico, farmbush, 00°16′48″N/006°35′29″E, 1174m, 9–16 April 2001 (4 males, 7 females), C.E. Griswold collector, and 25 April 2001 (1 male, 3 females), J. M. Ledford collector; Parque Nacional Ôbó, forest between Lagoa Ameila and Bom Sucesso, 00°16′48″N–00°17′19″N/006°35′29″E–006°36′45″E, 1200–1500m, 15–25 April 2001 (6 males, 11 females), C.E. Griswold collector, 25 April 2001 (1 male) and 5–14 May 2001 (177 males, 114 females), J. M. Ledford collector; Parque Nacional Ôbó, forest near radio tower, 1.63 air km WSW of Bom Sucesso, 00°16′34.0″N/006°36′20.0″E, 135m, 9–16 April 2001 (110 males, 112 females), C.E. Griswold collector.

***Straneoa seligmani* Kavanaugh, sp. nov.**

Figs. 2, 4, 6, 8, 10,12.

Types.— Holotype, a male, deposited in the California Academy of Sciences (CAS), labeled: "CASENT5001008"/ "REPUBLIC OF SÃO TOMÉ AND PRÍNCIPE: Ilha São Tomé, Parque Nacional Ôbó, forest between Lagoa Ameila and Bom Sucesso, pitfall trap, 1200–1500m,"/ "0°16′48″–0°17′19″N 06°35′29″ –06°36′45″E, 5–14 May 2001, #563PFT J.M. Ledford collector Cal. Acad. Sci Coll. STP-001"/ "HOLOTYPE *Straneoa seligmani* Kavanaugh, sp. nov., des. by D.H. Kavanaugh 2005" [red label]"/ "California Academy of Sciences Type No. 18058". A total of 15 paratypes (3 males and 12 females) are also deposited in CAS (see specimen data below, under Geographical distribution).

Type locality.— Forest between Lagoa Amelia and Bom Sucesso, 1200–1500 m, Parque Nacional Ôbó, Ilha São Tomé, Republic of São Tomé and Príncipe.

Etymology.— I am pleased to name this species in honor of Edward S. "Ned" Seligman, Director of STeP-UP and long-time resident of São Tomé, who has dedicated his career to the betterment of the African environment and its peoples.

Diagnosis.— Adults of this species (Fig. 2) are easily distinguished from those of *S. collatata* by their smaller size (SBL = 7.8 to 8.1 mm in males, 7.6 to 8.8 mm in females) and the relatively narrow explanation and shallow subapical sinuation of the lateral elytral margin (Fig. 6). In comparison, *S. collatata* adults (Fig. 1) are larger (SBL = 13.2 to 16.5 mm in male, 12.7 to 17.2 mm in females) and have the elytra markedly explanate laterally (Fig. 5) and with a deep subapical lateral sinuation. In additional, males of *S. seligmani* (Fig. 8) lack the two longitudinal rows of adhesive setae found ventrally on anterior tarsomeres 1 to 3 in *S. collatata* males (Fig. 7). Internally, *S. seligmani* males have the median lobe relatively short and thick with a short and broad apical lamella in lateral view (Fig. 10) and the parameres relatively large, whereas *S. collatata* males have the median lobe long and slender with a longer and narrower apical lamella (Fig. 9) and relatively shorter parameres. Apical gonocoxite 2 of the ovipositor is short and relatively broad basally in *S. seligmani* females (Fig. 12), much longer and narrower in *S. collatata* females (Fig. 11). Several other distinguishing features are noted in the description below.

Description.— Size medium (Fig. 2), ABL = 10.9 to 11.3 mm in males, 10.6 to 12.3 mm in females [14.1 to 18.1 mm in males and 14.1 to 19.2 mm in females of *S. collatata*]. Head, pronotum, and elytra rufopiceous to black, with lateral margins of pronotum and elytra paler, reddish-brown; antennae, palpi and legs reddish-brown; head shiny, pronotum and elytra dull [but not quite as dull matte as in *S. collatata*]; dorsal microsculpture of isodiametric meshes, very faintly

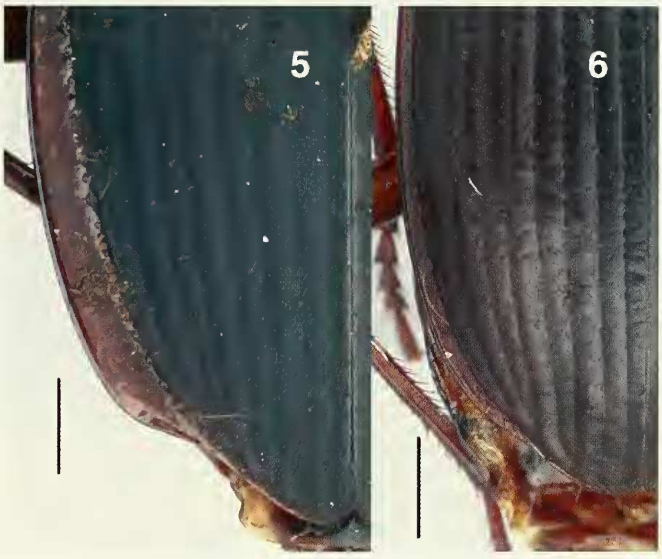
FIGURES 1–2. Digital images of habitus, dorsal aspect. 1. *Straneoa collatata* (Karsch); 2. *Straneoa seligmani* Kavanaugh sp. nov.; scale lines = 1.0 mm.

impressed on head, very deeply impressed on pronotum and elytra; body (except head) with barely visible vestiture of very fine, very short and widely scattered setae [same in *S. collatata*, but not previously described].

Head large, moderately broad; eyes slightly reduced in size [slightly larger in *S. collatata*] with tempora slightly lengthened; antennae relatively short, extended only to basal one-third of elytra [longer, extended to middle of elytra in *S. collatata*], antennomere 4 only three times as long as wide [four times as long as wide in *S. collatata*]; vertex with five pairs of supraorbital setae (4 pairs in a few specimens), including two or three pairs in the typical position and two additional pairs in a row extended posteromedial [same in *S. collatata* except that most specimens have only four pairs]; mentum with a moderately bifid medial tooth; submentum with two pairs of lateral setae. Pronotum (Figs. 2 and 4) large and broad, broadest at or slightly behind middle, slightly broader

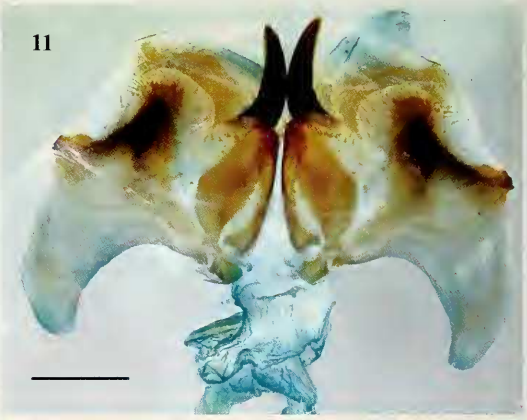
across base than across apex, broadly explanate laterally; apical, basal and lateral margins with complete and narrow margination; apical margin smoothly arcuate; apical angles slightly narrowed and bluntly pointed [broader and more rounded in *S. collatata* Fig. 3)]; posterior angles roundly obtuse; lateral margin with two (in one specimen examined three) midlateral seta, the first located at about the apical one-third of the margin, the second slightly posterior of the midpoint of the margin [one midlateral seta in many *S. collatata*, but, where two occur (Fig. 3), the first is only slightly anterior to the second located at the midpoint of the margin]; basolateral pronotal setae present at or very slightly anterior to angle [distinctly anterior of angle (Fig. 3) in most *S. collatata*]; anterior and posterior transverse impressions very shallow, medial longitudinal impression deep and sharply defined, basolateral foveae very short.

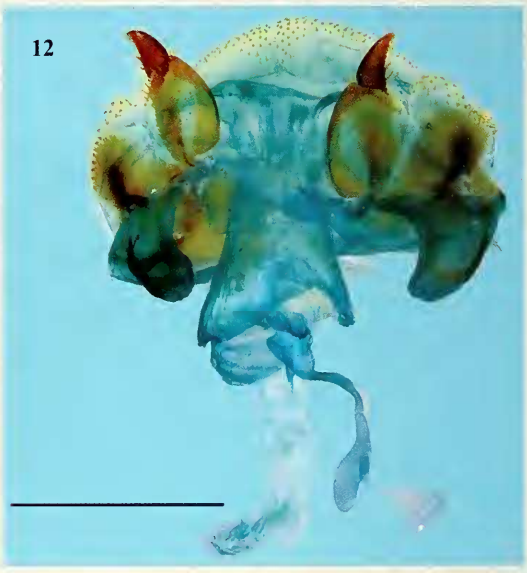
FIGURES 3–4. Digital images of left lateral portion of pronotum, dorsal aspect viewed from about 30° oblique right. 3. *Straneoa collatata* (Karsch); 4. *Straneoa seligmani* Kavanaugh sp. nov.; scale lines = 1.0 mm.



FIGURES 5–6. Digital images of apical portion of left elytron, dorsal aspect. 5. *Straneoa collatata* (Karsch); 6. *Straneoa seligmani* Kavanaugh sp. nov.; scale lines = 1.0 mm.

Elytra subquadrate (Figs. 2 and 6) [subovoid in *S. collatata* (Figs. 1 and 5)], solidly fused along midline [also in *S. collatata*], broad basally, nearly flat medially and more steeply sloped laterally from interval 7 [barely but evenly sloped from midline to lateral margin in *S. collatata*]; base completely margined; humeral angles distinct but broadly rounded; lateral explanation moderately broad [markedly broad in *S. collatata*]; apices broadly rounded [roundly angulate in *S. collatata*]; striae distinctly impressed and punctate [faintly impressed and only faintly punctate in *S. collatata*], scutellar striole present, short; intervals slightly convex, interval 3 with two to four setiferous pore punctures (two in most specimens) mainly in the apical half, interval 5 without or with one or two punctures (none in most specimens) in the basal half, and interval 7 with one to five punctures (one in most specimens) in the basal half; scutellar pore puncture absent; umbilicate series with 26 to 28 setiferous pore punctures [30 to 40 punctures in *S. collatata*]. Hind wings apparently completely absent [in both species; I was unable to find any wing vestige in any of the 8 specimens of





FIGURES 7–8 (upper left). Digital images of male right anterior tarsus, ventral aspect. 7. *Straneoa collatata* (Karsch); 8. *Straneoa seligmani* Kavanaugh sp. nov.; scale lines = 1.0 mm.

FIGURES 9–10 (lower left). Digital images of male genitalia, left lateral aspect. 9. *Straneoa collatata* (Karsch); 10. *Straneoa seligmani* Kavanaugh sp. nov.; scale lines = 1.0 mm.

FIGURES 11–12 (right). Digital images of stained dissection of female genitalia and reproductive tract, ventral aspect. 11. *Straneoa collatata* (Karsch); 12. *Straneoa seligmani* Kavanaugh sp. nov.; scale lines = 1.0 mm.

each species relaxed and examined].

Legs of moderate length [relatively longer in *S. collatata*]; middle and hind tibiae each with distinct longitudinal sulcus dorsally on medial surface and a vague sulcus dorsally on lateral surface; tarsi slightly short and broad [relatively longer and narrower in *S. collatata*], anterior tarsi (Fig. 8) with tarsomere 1 broad and elongate, tarsomeres 2 to 4 short, triangular and as broad as long, tarsomere 5 elongate and broadest near mid-length [in *S. collatata*, tarsomeres 1 to 3 elongate, parallel-sided, tarsomere 4 triangular but 1.5 times as long as wide, tarsomere 5 elongate but broadest near apex], males without adhesive setae ventrally on tarsomeres 1 to 3 [tarsomere 1 to 3 with two longitudinal rows of adhesive seta in *S. collatata* males (Fig. 7)]; all middle and hind tarsomeres dorsally with three longitudinal sulci (lateral, mid-dorsal, and medial) delimiting two nar-

row paramedial longitudinal carinae (more markedly developed on hind than on middle tarsomeres) [in *S. collatata*, only two longitudinal sulci present on all middle and hind tarsomeres (the mid-dorsal sulcus absent) delimiting a single broad mid-dorsal carina], fifth tarsomeres with two or three pairs of fine setae arranged in two longitudinal rows ventrally [three to five pairs of such setae in *S. collatata*].

Abdomen with visible sterna 3 to 5 each with one pair of posterior paramedial setae, sixth visible ("anal") sternum with one pair of apical paramedial setae in males, two such pairs in females. Male genitalia (Fig. 8) with median lobe of aedeagus moderate in length and breadth, ventral margin smoothly arcuate from articulation of parameres to apex and with apical lamella short and moderately broad in lateral view [median lobe elongate and slender in *S. collatata*, with the apical lamella longer, more slender and slightly deflected ventrally], moderately broad sub-basally and only slightly inflated around mid-length in ventral view [distinctly narrowed sub-basally and inflated around mid-length in *S. collatata*]; left paramere relatively large and elongate-ovoid, right paramere of similar shape but smaller, two-thirds the length of left, and narrower [parameres of similar proportions to each other in *S. collatata*, but both relatively shorter in relation to the median lobe and both more narrowed basally and widened apically].

Female genitalia and reproductive tract (Fig. 12) with basal gonocoxite 1 with 11 to 12 setae arranged in a more or less continuous row, with a few extra setae basal of this row medioventrally in some individuals [similar in *S. collatata* (Fig. 11), but with additional medioventral setae present in most individuals basad of the row as a sparse patch of setae]; apical gonocoxite 2 short, broad basally and abruptly arcuate [distinctly longer, narrower basally and less abruptly arcuate in *S. collatata*], with two dorsolateral and one dorsomedial ensiform setae; bursa copulatrix broad, skirt-like, without sclerites and glabrous internally; spermathecal reservoir elongate ovoid, spermathecal duct narrow but broad before insertion on bursa, spermathecal gland duct insertion at base of spermathecal reservoir [similar in *S. collatata*].

Sexual dimorphism.— Among most carabid species, females are typically at least slightly larger than males, but in both *Straneoa* species, this trend seems not to apply. For the samples examined of both species, the size range of males fell completely within the size range of females (i.e., for both species, both the largest and the smallest specimens examined were females). Also, males of most carabid species typically have at least some of the anterior tarsomeres dilated in comparison with the same tarsomeres of females. In both *Straneoa* species, the difference in this feature between males and female is very slightly, if at all evident. The only consistent external feature distinguishing the sexes in both species is the number of pairs of apical paramedial setae on the sixth visible ("anal") sternite, with one pair in males and two pairs in females.

Geographical distribution.— At present known only from Ilha São Tomé, at the following localities (Fig. 13): Parque Nacional Ôbó, forest between Lagoa Ameila and Bom Sucesso, 00°16′48″N–00°17′19″N/006°35′29″E–006°36′45″E, 1200–1500m, 25 April 2001 (1 male) and 5–14 May 2001 (2 males, 4 females). J. M. Ledford collector; Parque Nacional Ôbó, forest near radio tower, 1.63 air km WSW of Bom Sucesso, 00°16′34.0″N/006°36′20.0″E, 135m, 9–16 April 2001 (1 male, 8 females), C.E. Griswold collector.

Geographical relationships with related species.— *Straneoa collatata* adults were collected at both localities where *S. seligmani* adults were found; and *S. collatata* adults were found alone only at the Ecofac Jardin Botanico in Bom Successo. Adults of both species were collected in the same pitfall traps at the same time, so these species are largely, if not fully, microsympatric. However, adults of the two species differed greatly in abundance, at least during the survey period of April–May, 2001, with the ratio of *S. collatata* to *S. seligmani* adults collected about 35 to one.

Habitat distribution.— Adults of *S. seligmani* and *S. collatata* were found together in well-

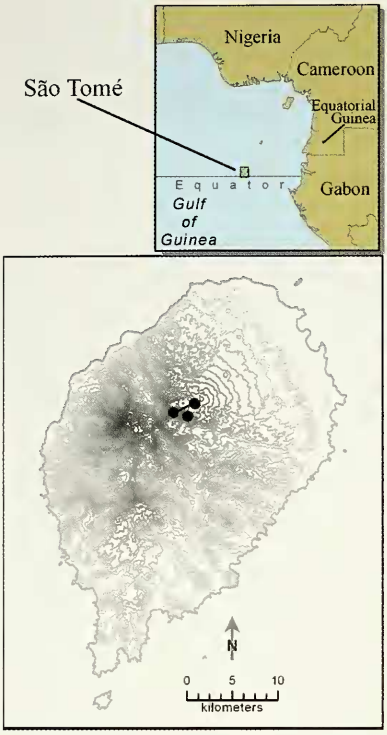


FIGURE 13. Contour map of Ihla São Tomé (in Geographic WGS84 projection) showing the location of collecting sites for *Straneoa seligmani* and *S. collatata* (solid dots; line collecting dots denotes a collecting transect); contour intervals = 100 m; insert showing location of the Ihla São Tomé in the Gulf of Guinea and in relation to the Equator and adjacent mainland Africa.

FIGURE 14. Photograph of forest habitat of *Straneoa seligmani* and *S. collatata* at the edge of Lagoa Amelia, Parque Nacional Ôbó, Ilha São Tomé; expedition members in foreground (R.C. Drewes, photographer).

preserved montane rainforest at elevations from 1200 to1500m. They were collected by hand under stones and logs during daylight hours and, together, were so abundant in the Lagoa Amelia area (Fig. 14), for example, that they were found under virtually every stone or log turned [C.E. Griswold, personal communication]. They were also collected from dusk onward through the night while they were active, running on the ground. Large numbers of adults were also collected in pitfall traps placed on the forest floor.

LIFE HISTORY.— Three of the 16 specimens examined were distinctly teneral, and several others were more heavily pigmented but still not fully hardened. Dates of collection for these teneral specimens ranged from 9 April to 14 May 2001, documenting the emergence of at least part of the population of new adults during this period. Nothing else is known at present about the life history of either *S. seligmani* or *S. collatata*.

COMMENT ON TAXONOMIC PLACEMENT.— Many of the genera of platynine carabids described to date have been proposed on the basis of features less dramatic and distinctive than the differences in tarsal form and chaetotaxy described here between *S. seligmani* and *S. collatata* adult males. For example, several genera in the Malagasy fauna (Basilewsky 1985) are distinguished by simple tarsal characters alone. Nonetheless, I choose to include *S. seligmani* and *S. collatata* in a single genus because (1) they appear to be most closely related species among all known platynine species and (2) the generic classification of platynines worldwide is badly in need of review, and adding a new monotypic genus to the world list of genera contributes nothing to either classification or understand relationships among platynines. Equivalent differences in tarsal form and chaetotaxy can be found among different species of the genus *Nebria* Latreille (Carabidae: Nebriini).

ADDITIONAL COMMENTS.— The co-occurrence of two clearly distinct yet apparently most closely related species of a genus likely endemic to a single, relatively small island like Ilha São Tomé is, I think, quite surprising. Collection data indicate microsympatry and similar habitat pref-

erences for the two species; but several major differences in form and structure also suggest that their members may behave in very different ways in the same space. Do these two species, in fact, share a most recent common ancestor, i.e. are they sister species? If so, what selective forces promoted their differentiation and what were the isolating mechanisms that led to their speciation? Is this an example of sympatric or parapatric speciation, or did allopatry have a role in the evolutionary history of this small group? These are just some of the questions that arise from the discovery reported here — questions that can only be answered with additional field and laboratory study.

Acknowledgments

I am grateful to Charles Griswold, Joel M. Ledford, and Jens Vindum for their collecting efforts above and beyond their own personal field objectives, which efforts produced the entire material basis of this study. Charles also generously shared his field notes and recollections from the expedition. Christine Arata provided a very helpful translation of parts of Straneo's paper (1943) in which he described *Platynus opacipennis*. Digital images in Figures 3–4 and 7–12 were taken by April Noble. Michelle Koo created the contour map of São Tomé showing localities sampled, based on a CAD rendition of a 1:25,000 scale topoquadrangle by Angus Gascoigne and Thomas Wojciechowski. I thank all of these colleagues most heartily for their contributions to this paper. The 2001 Expedition was supported by funds from the In-House Research Fund and the G. Lindsay Field Research Fund at the California Academy of Sciences. This paper represents contribution No. 37 of the Center for Biodiversity Research and Information of the California Academy of Sciences.

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